CLAIMS

What is claimed is:

1 A method for using an audio transducer as both an input device and an output device comprising the steps of:

(a) digitally modulating a primary input signal for driving the transducer as an output device;

(b) sampling an output signal generated from the transducer during off times of the modulated signal; and

(c) determining an input signal from the sampled output signal.

2 The method of claim 1 wherein the input signal is determined by subtracting the primary input signal from the sampled output signal.

3 The method of claim 1 wherein the input signal is determined by subtracting the primary input signal and subtracting an echo canceling signal from the sampled output signal.

4 The method of claim 1 further including the step of: providing an interface for mixing a secondary signal with the primary input signal.

5 A method of using an audio transducer as both an input device and an output device, wherein the audio transducer is responsive to a modulated signal that transitions between active and inverted, such that the audio transducer acts as an output device when the modulated signal is active, the method comprising the steps of:

(a) detecting when the modulated signal is inverted; and

(b) in response, sampling an output signal from the audio transducer in order to detect an input audio signal.

6 The method of claim 5 further including the step of: filtering the sampled input audio signal.

7 The method of claim 6 further including the step of: normalizing a primary input signal and subtracting the normalized primary input signal from the filtered input audio signal.

8 The method of claim 7 further including the step of: canceling echo from the normalized and filtered input audio signal.

9 The method of claim 5 further including the step of: providing an interface for mixing a secondary signal with the primary input signal.

10 The method of claim 5 wherein step (b) further includes the step of: amplifying an output signal.

11 The method of claim 10 wherein step (b) further includes the step of: using an A/D converter to sample the amplified output signal.

12 The method of claim 5 wherein step (a) further includes the step of: using sample control logic to detect the inverted modulated signal, and for activating an A/D converter that performs the sampling.

13 The method of claim 5 further including the step of: outputting the modulated signal from a digital pulse modulated amplifier to a power switch, wherein the power switch switches on when the modulated signal is active to drive the audio transducer as a speaker.

14 The method of claim 13 wherein step (b) further includes the step of: sampling the output signal from the audio transducer during power switch off-times.

15 The method of claim 14 further including the step of: during power switch off-times, using sample control logic to detect when the digitally modulated signal is inverted and activating an A/D converter to perform sampling.

16 A bi-directional audio frequency circuit, comprising:

an audio transducer;

a system interface for outputting a primary input signal ;

a circuit for generating a digital pulse modulated signal from the primary input signal, wherein the digital pulse modulated signal transitions between active and inverted;

a power switch coupled to the audio transducer, the power switch having on-times when the digitally modulated signal is active and off-times when the digital pulse modulated signal is inverted, wherein the audio transducer is driven as an output device during power switch on-times; and

microphone generation means coupled to the audio transducer for sampling output signal from the audio transducer during power switch off-times to detect an input audio signal.

17 The circuit of claim 16 further including means for filtering the sampled input audio signal.

18 The circuit of claim 17 further including means for normalizing the primary input signal and subtracting the normalized primary input signal from the filtered audio signal.

19 The circuit of claim 18 further including an echo canceling filter for canceling echo from output from the normalizing means.

20 The circuit of claim 19 wherein the microphone generation means further includes means for amplifying the output signal.

21 The circuit of claim 16 wherein the microphone generation means further includes sample control logic and an A/D converter, wherein the sample control logic detects the inverted digitally modulated signal and activates the A/D converter in response.

22 The circuit of claim 16 further including an interface for mixing a secondary signal with the primary input signal.